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Margaret B. White
Margaret B. White

11-7-02

DATE

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicants: Ramesh

Group Art Unit: 1771

Serial No.: 09/472,088

Examiner: Hai Vo

Filing Date: December 23, 1999

Docket No.: D-30030-01

Title: POLYOLEFIN FOAM COMPOSITE STRUCTURE AND METHOD FOR
MAKING THE SAME

DECLARATION UNDER 37 CFR §1.132

I, Natarajan S. Ramesh ("N. S. Ramesh"), declare the following:

1. I am the named inventor in the above-identified patent application.
2. I received a PhD in Chemical Engineering from Clarkson University, Potsdam, NY, in 1992; a M.S. Degree in Chemical Engineering from Clarkson University, Potsdam, NY, in 1985; and a B.Tech degree in Chemical Engineering from the Coimbatore Institute of Technology, which is affiliated with the University of Madras, Madras, India, in 1982. I have been employed by Sealed Air Corporation since 1992 as a researcher in the field of polyolefin-based foams.
3. I have read and understand the disclosure set forth in U.S. Pat. No. Hurley et al. (US 5,938,878). I understand this patent to disclose a laminated foam structure having a core material. I further understand that,

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at column 7, line 66, Hurley discloses that the core has a thickness of between 1/8 to 3/8 inch. Since 1 mil = 0.001 inch, this equates to a core thickness of between 125 to 375 mils.

4. I have discovered that a coating of ethylene/propylene rubber, homogeneous ethylene/alpha-olefin copolymer, or ethylene/acrylic acid copolymer may be used to bond two polyolefin foam sheets having different chemical compositions at a bond strength of at least about 4 lb_f/inch when such coating has a thickness ranging from about 1 to about 6 mils. Surprisingly, I found that thicker coatings, such as those disclosed in Hurley, resulted in a lower bond strength, i.e., less than 4 lb_f/inch. This is significant because, for commercial applications, e.g., when a PE foam/PP foam composite structure is used to make a bodyboard or other watersport article, a bond strength of at least 4 lb_f/inch is required.

5. The difference between a 5-mil and a 10-mil coating of ethylene/propylene rubber (EPR) and its impact on bond strength may be illustrated by the following comparative experiment. 100% EPR (Adflex KS 359P ethylene/propylene rubber, as described in Table 1 at page 13 of my patent application) was coated onto the surface of a 6 pcf, 0.125" thick LDPE foam sheet as described in the Examples of the application (pages 13-14). The EPR was heated to a melt temperature of 378 °F. A 5-mil coating was applied to the foam surface by using an extrusion screw speed of 29.7 rpm; a 10-mil coating was produced with a screw speed of 37.8 rpm. Each of the resultant coated foam sheets were cut into 1" wide strips. The EPR coating was then heated using hot air and brought into contact with a heated surface of 1.5 pcf, 1" wide PP foam strips as described in the Examples of the application (page 14).

6. Two different PE foam/PP foam composite structures were thereby produced, one being bonded with a 5-mil EPR coating and the other being bonded with a 10-mil EPR coating. The bond strength between the PP and PE foams was measured in accordance with ASTM F904-98. The average results obtained for testing 5 samples of each composite are set forth in the table below.

Coating/Coating Thickness	Bond Strength, lb _f /inch (ASTM F904-98)	Comment
EPR / 10 mils	1.586	Poor adhesion and non-uniform bonding.
EPR / 5 mils	4.655	Excellent adhesion between PE and PP foam surfaces; 193.5%* improvement in bond strength vs. 10-mil coating.

* $((4.655-1.586)/1.586) \times 100$

7. As demonstrated, the bond strength between PP and PE foam surfaces was found to be far greater using a coating of 5-mil thick EPR as the bonding material than a 10-mil thick coating. Unexpectedly, the bond strength of the composite structure with the 5-mil coating was 193.5% greater than the bond strength resulting from the 10-mil coating. Such improvement indicates that a coating thickness of about 1-6 mils is the most preferred range for commercial production, not only because of the higher bond strength, but also because it requires less material usage.

8. Finally, I declare that all statements made herein of my own knowledge are true, and that all statements made herein on information and belief are believed to be true. Such statements were made with the knowledge that willful false statements and the like are punishable by fine

or imprisonment, or both (18 U.S.C. 1001) and may jeopardize the validity of the present application or any patent issuing therefrom.

Declared this 31th day of October, 2002.

N. S. Ramesh

Natarajan S. Ramesh